Investment Projects in the Energy Sector - Bottleneck Financial Sources

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1) Introduction

The energy industry is one of the most investment-intensive industries in the world. Asset projects in the organic growth or Merger & Acquisition Projects determine the investment policies of the energy industry in the European market. Investment projects in the hundreds of millions and even billions of euro and investment duration of 30-50 years are common.

The bottleneck for the investment activity of the energy industry are the financial resources of the company [10, p.3], especially in these days in which the rating agencies observe very well the dept/equity-ratio of all public and private organizations.

Numerous investment opportunities for energy companies can be differentiated. Investment in nuclear energy is interesting now to reduce CO2-emission but investments in coal plants currently are under political pressure because of the same reason. There are a large number of investment opportunities that competes for the limited resource "capital" like grid investments, wind parks or projects like electricity from the desert.

The economic theory in dealing with bottlenecks sets out clearly that profits can be optimized such that per unit of limited resource the profit needs to be maximized [12, p. 328]. To apply this in the above described capital restriction the energy sector has to focus on the internal rate of return (IRR) of an investment [6, p. 23], which indicates how much interest can be accomplished in one unit of capital used in a project. Of course, investment is not only decided by a purely logical and structured point of view - or abandoned. Short-term opportunities, stakeholder influences, tactical preferences and not least personal assessments of leaders play an important role as well. But the base of each decision is a business case (BC) based on the net present value (NPV) and the IRR [1, p. 93]. The BC pictures the expected project into a mathematical model where - based on the NPV or the IRR method - the expected interest or value of a project can be measured and derived.

This contribution focuses on the immense practical relevance of the instrument of BC (NPV and IRR). In subsequent chapters the NPV/IRR method is presented. Thereafter the spotlight is directed to four issues of the use of BC, which makes its practical significance. These areas are a) force the participants to a careful planning, b) to manage risks in the project, c) to analyse sensitivities of a project in relation to important influencing factors and d) to use the BC as a basement for the project documentation or even the contracts with clients or internal target settings.

2) The net present value method

The net present value method is based on the opportunity cost principle. Its crucial point is then, that the company can use an available alternative. This relates in part to investment alternatives. For example, an amount of € 100 million can be invested in the project A (construction of a combined heat- and power-plant) as well as in the project B (purchase of company shares of a municipal utility). The NPV method shows which of these alternatives optimizes the profit performance of the company and therefore the company's value. The opportunity cost principle is also the basis of the NPV method in itself and therefore makes it possible to also assess individual projects. This is done by comparing the theoretical possibility to invest the money on the capital market [4, p. 97]. The funding requirements of the company are shown on the required rate of return within the NPV method. Is a project (for example the construction of a wind turbine) more promising than the expectations of any funds in the capital market, it is shown in a positive NPV.

The core of the NPV method is that the cash flows at different times have different values [4, p. 9]. Cash flows at different times cannot be compared directly - with the help of the NPV method all cash flows of an investment can be converted to a set time “t” and then the values can be compared or even added. Normally, this specific time is "The Today" with t = 0 in order to provide the decision-makers an indicator for the decision as simple, current and realistic as possible. The formula for calculating the net present value (NPV) is generally as follows [4, p. 13]:

$$NPV = \sum_{t=0}^{N} \frac{C_t}{(1+r)^t}$$

The Cash of each period (C_t) is discounted with the interest rate "r" as an opportunity interest rate of the company. These values (all are now in the time 0) can be added.

Dividing the rear part of the formula apart in cash for the period (C_t) and the discount rate ($1 / (1 + r)^t$), then the formula is easier to understand. The cash of every period results from the assumptions and conditions of the project. The discount rate is the mathematical part, which discounts the cash values down to the period 0 [8, p. 52].

The following figure illustrates this method:

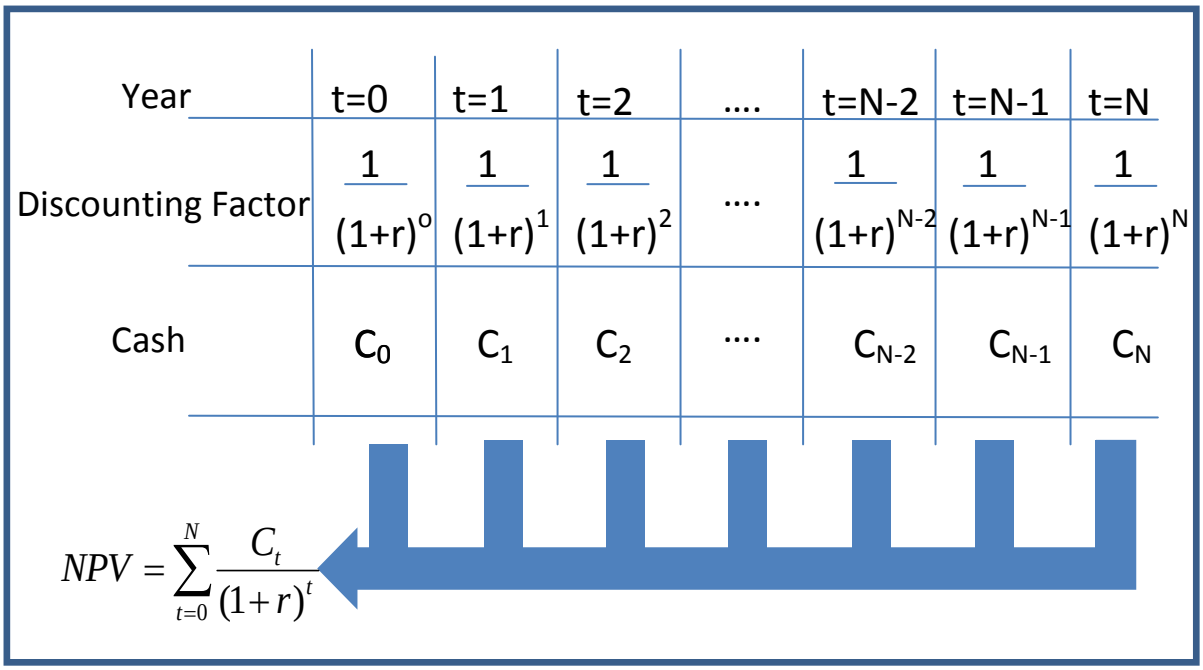

Figure 1: Discounting methodology

If the NPV is greater than zero, the project is positive – it should be performed. The returns from investment are therefore higher than a comparable interest in the capital market. If the NPV = 0, the investment is as good as a comparable investment in the financial market. This situation of the breakeven point NPV = 0 we make later exploited in the calculation of the IRR. If the NPV is less than zero the investment should be discarded because they can better invest the money on the financial markets [4, p. 33].

The NPV can be interpreted as an additional value contribution for the company by the project (added value). If your company has the opportunity to perform a project with a positive NPV you should add this project to your portfolio, because by implementing it, the value of the company will grow.

One small example: it is offered to you to buy right now an existing windmill for 1.0 million Euros. After the 7 years it is out of the economic life time (high risk of malfunction) so the maintenance contract finishes as well and you have to demolish the windmill after 7 years (costs for this in 7 years: 100.000 Euro). The price for the produced electricity is fixed for the next 7 years and according to the situation of the wind in the site you will earn 350.000 Euro every end of the year in average by selling the electricity. You expect 50.000 Euros for the maintenance every end of the year. Your opportunity to give the money to the financial market would allow you to receive 5% interests every year (assumption: no taxes / no inflation). By applying the above mentioned formula the NPV for this example is nearly + 0.65 million Euro. So you should do this business – the cash of the project discounted to t=0 is very positive and the value of your company will increase by 0.65 million Euro.

A special role in the NPV method plays the target interest rate "r" for the calculation of the NPV. It is predicted from the financing opportunities of the company and a weighted average of the real rate between equity and credits. The company needs equity (as usual more expensive because taking the risks of the company) and also uses as much as possible cheaper loans. The lenders expect certain equity in the company, so that an unlimited extension of the debt is not possible. Beside this some additional costs (special premiums for riskier countries, special premiums for emerging markets) will be used so that in reality the company-wide common predetermined discount rates are far above any credit rate as for mortgages. In business 'r' is called ‘hurdle rate’ - so in order to be recommended for implementation every project should at least be on the level of the hurdle – better: much higher.

Connected with this we can go the next step to another calculation to bring transparency to a project. If a project achieves a higher NPV than zero, it is obvious, that the project has a higher internal return than ‘r’. By increasing ‘r’ in small steps within the calculation the NPV will be smaller and smaller till NPV is exactly zero. This result of new ‘r’ in which the NPV of a project becomes zero is called Internal Rate of Return (IRR) [1, p. 71]. It shows to which extend the project will return profit on one Euro from the initial investment.

In the above started example the IRR equals to 22% - this investment brings 22 % return to every invested Euro. It should be implemented.

As mentioned the profit optimization under bottleneck conditions is dependent on the profit per unit bottleneck. The project with the highest specific profit per unit of capital is realized so first and then the project with the second highest profit etc. till the capital limit is reached [4, p. 138]. The profit per unit of capital is nothing other than the IRR. All projects with a lower IRR than ‘r’ will per se not be taken into consideration. All projects with a higher IRR than ‘r’ could be realized, but because of the limits of capital they must be restricted as well. The next diagram illustrates the business value optimization [5, p. 222]. Everything left of the capital restriction line ‘capital available’ is realized. The project portfolio A/B/C/D will be implemented.

Using the NPV method for the project portfolio the shareholder value can be maximized.

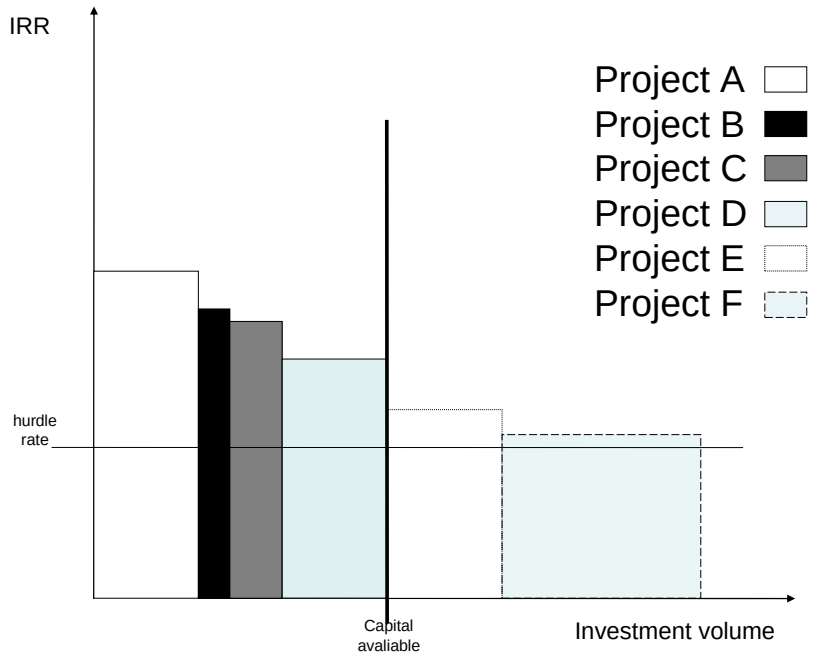

Figure 2: Optimization of the project portfolio under capital restrictions

If a decision for projects within the portfolio of options was taken the next step of success lays in the hands of the project team which now begins to realize the projects. The continued use

of BC's offers a wealth of opportunities to manage projects successfully. In the next four chapters tried-and-tested methods around BC's are presented which help to direct a project from the initiation down to the defined project goals.

3) Focus 1: BC forces to plan

The phases of a project are usually divided into the initiative, planning, execution and completion. Across from the beginning to the end the controlling is described as the fifth phase. In this section the focus is on the first two phases: initiative and planning. In the initiative phase often highly ranked managers generated ideas, which are then to realize by project teams. Then a project manager is appointed who is often close to his superior and tends to perform an uncritical implementation of the wishes of his boss. But the question must be at first whether this or that idea really offers customers the desired results or not or if the owner of a company really receives an added value from this project. To avoid this in almost all major companies so-called project manuals or investment policies are put into force that implements BC's as an integral part of every decision for the management. Moreover, the four-eye principle is implemented by the project manuals: the Control Department usually creates the BC together with the Project management. A BC is created in a rough form already in the initiative phase to receive financial transparency. But the final go-ahead for a project needs a detailed plan and a detailed BC has to be created before the last decision to start. In customer business it is normal to calculate very well the profit by a detailed planning. Especially in internal projects the project planning is often seen as a not needed step what is wrong and often leads to burning money.

A mandatory BC forces all parties to see the project "financially". The goal of a project is not only "technical", "seasonal", "design related" or "legal". This financial view provides the possibility to control shareholder value and corporate profits in a safe way.

4) Focus 2: The net present value method as an instrument to manage risks

If one accepts the benefits of BC's without the drawbacks to lose sight of (BC based on assumptions that may be wrong) there is a further application of the BC as a risk management tool. The NPV method allows calculating the concrete quantitative impact of the variances of the critical assumptions. An Example: given is the possible construction of a coal power plant,

in which it is assumed that an efficiency of 43% can be achieved. With this efficiency, the BC (NPV) is positive. The engineers make clear, that the 43% can be achieved only if all factors (boiler insulation, supply water temperature, coal quality, the number of switch on/off of the boiler, etc.) can be optimally adjusted. The engineers assume that in the worst case only 41.5% can be achieved, but this is only to be expected with a probability of 5%. Using the net present value method now a second BC can be calculated with the efficiency of 41.5%. If this BC is still positive, it is clear that the project even in the worst case is without financial risks. If the BC would be negative in the worst case scenario, there is still no clearness. Here one can use the net present value method to incorporate these conditions to the BC in combination with their probabilities:
0.05 probability with efficiency 41.5%;
0.95 probability of occurrence with 43% efficiency.
These values can be processed easily in a BC.

In the comments on the discount rate "r" in Chapter 2 it has already been noted that risk premium can be used. So the NPV method also can be a measure in the risk management! Increased return on investment requirement creates reserves for project failures - it can be seen almost as an internal insurance.

5) Focus 3: The NPV method enables to analyse sensitivities of a project in relation to important influencing factors

As was shown in the previous section, the creation of a BC allows a greater transparency in risks that have been identified by project members. The NPV method can also be applied as a method to analyse sensitivities of a project in relation to important influencing factors [4, p. 122]. Compared to the chapter above this is a contribution to the identification of new risks. Such an analysis is performed to look how the BC and thus the proposed project respond to disturbances. An example: if the guideline for investment projects defines a discounting factor "r" in a transparent way in general all is clear. But investments in the energy sector are long term and it is easily possible that the opportunities to finance this investment might change during the project duration. To examine how the project responds to changes in interest rates it can be reduces or lifted in 0.1 %-steps and one can easily see how the BC is responding to this factor. If the results depend very much from "r" it can be advised to seek for long term financing contracts with fixed terms.

Sensitivity analysis are often used for changes in the exchange rates or oil price fluctuations (than can be hedged). Inflation or staff cost trends are further applications for sensitivity analysis.

It is clear that the BC can offer help in the identification and analysis of risks. A BC is a reflection of future actions but it can also help to achieve these targets and to force these future actions to be successful.

6) Focus 4: Liability of approaches in BCs

Very often project managers who lead the project or the high level manager who initiated the project like to show the costs of the project on a low level and boost the possible profits. Both – project managers and the management - have a high interest to do the project. It is the idea of the manager and the project manager wants to show abilities .Costs and profits will "happen" in the future and no one might check it than. This leads to a nice BC with high profits. After the decision to go for the project all participants tend to lose sight of the BC. Here are mentioned two examples that illustrate the problem:

a) The marketing director has prepared an advertising campaign for the product "gas" to generate about 10% more customers (about 15,000 households). But the campaign is so expensive that the BC would have a positive result only with the additional margin of 18,000 new customers. Thus he quickly estimates a few thousand customers more – knowing that the 10% estimate was already based on instincts and therefore an increase to 12% is difficult to appeal. With this change the campaign even after protest of the Control Department will be implemented

b) The locally active XY utility for electricity and gas will be asked in the context of the overall corporate strategy to outsource its IT department and to integrate into the central IT Company of the Group. XY has to pay than an IT-service fee to headquarter. The time savings and synergies are promised to be built in the centre and should be passed with 50% to XY. Thus the XY-BC is positive per definition in comparison to the status quo. But in the second year after introduction of the central IT, the IT-costs billed through the centre increased such that now the external IT costs by far exceed the former stand-alone cost.

These examples show realistic cases how to manipulate BC or not to fulfil promises – this can be resolved with a link to the used BC.

In case a) the bonus award can be linked to the success of the campaign. The Marketing Manager shall be notified in advance that his bonus is linked to the achieved number of additional gas household customers. It is important to tell him before because the number of assumed new clients (e.g. 15,000 or 18,000) stands for 100% of his bonus - deviations above and below are taken into account in the bonus percentage. Suddenly you will be able to observe that the motivation of increasing to 18,000 new customers is greatly reduced. Even the Marketing Manager began to work on such savings in the marketing campaign that the BC to positively even so. This example can be applied to almost all projects that contain individually identifiable components with a unique responsibility assignment to employees. These identified components of the attachment of premiums can be: budget, bulk buying from suppliers, software costs.

In case b) one can recognize a simple rule of risk management: "all that is said can also be written down". It would be advisable that the representatives of the IT headquarter write down their promises 1:1 in contracts for the duration of the BC. This guarantees XY not to have just nice promises. In combination with variable pay it will lead to success otherwise the IT headquarter could keep the promises towards XY but higher actual costs could disappear in the large central budget.

The liability of the essential assumptions of BC's can be interpreted as a risk management tool. Uncertainties are fixed by the binding commit to contracts, agreements or objectives. This not only in general but also related to components of the project – it makes the project more stable.

7) Summary

The scientists speak of the Net Present Value method, but in practice this is called a Business Case and this implies the use of NPV. BC's are used in order to select alternatives: the best projects are allowed to use the scarce capital resources. In the energy sector, the NPV - in addition to the strategic filter of a company - is the main selection criterion for future project

portfolios. The portfolio is determined by the order of the IRR. But BC's are not only for project decision or selection. It forces to a careful planning and provides the basis for the on-going project control. BC allows the risk assessment and identification by calculating various versions or sensitivity analysis. By the force to plan, the support for risk management, the possibility to choose the right portfolio, to connect salaries and contracts and a controlling tool to reach the defined target the circle of a successful project management is closed.

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